

WE CLAIM:

1. An instrument for analyzing a sample, comprising:
a detection device configured to detect light from a sample at an examination site, a sample delivery axis extending vertically from the examination site; and
at least one material exchange station along the sample delivery axis above the examination site.

2. The instrument of claim 1, wherein the examination site is one of a plurality of examination sites located at an analysis station, each examination site having a sample delivery axis extending vertically from the examination site to the material exchange station.

3. The instrument of claim 1 further comprising a fluidics head that is moveable along the sample delivery axis to deliver fluid to the examination site.

4. The instrument of claim 3, wherein the fluidics head includes an array of fluid delivery channels.

5. The instrument of claim 4, wherein the material exchange station is configured to transfer pipette tips to and from the fluid delivery channels on the fluidics head.

6. The instrument of claim 3 further comprising a drive mechanism that causes the fluidics head to exert a force on pipette tips located at the material exchange station.

7. The instrument of claim 6, wherein the amount of force exerted by the fluidics head is variable depending on the number of pipette tips located at the station.

8. The instrument of claim 1 further comprising a carriage assembly that moves material to and from the material exchange station in a direction perpendicular to the sample delivery axis.

9. The instrument of claim 1 further comprising a second material exchange station, each material exchange station being located above the examination site along the sample delivery axis.

10. The instrument of claim 9, wherein each material exchange station has a carriage assembly that moves material to and from the material exchange station in a direction perpendicular to the sample delivery axis.

11. The instrument of claim 10, wherein a first of the material exchange stations exchanges pipette tips, the second material exchange station exchanges fluid using the pipette tips obtained at the first material exchange station.

12. The instrument of claim 11, wherein the first material exchange station is above the second material exchange station along the sample delivery axis.

13. A fluid delivery system, comprising:
a fluidics head assembly including a dispensing device;
a drive mechanism connected to the head assembly for moving the head assembly along a vertical sample delivery axis; and
at least two material exchange stations located along the sample delivery axis, the head assembly being moveable to each material exchange station to pick up or deposit materials used to conduct an assay.

14. The fluid delivery system of claim 13, wherein a first material exchange station transfers pipette tips to and from the dispensing device, and a second material exchange station transfers fluid using pipette tips obtained from the first material exchange station.

15. The fluid delivery system of claim 13, wherein each material exchange station has a carriage assembly that moves material perpendicular to the sample delivery axis.

16. The fluid delivery system of claim 13 configured for integration with a light detection instrument in a single housing.

17. The fluid delivery system of claim 13, wherein the fluidics head is moveable to an analysis station positioned below the material exchange stations along the sample delivery axis.

18. The fluid delivery system of claim 17, wherein the material exchange and analysis stations are positioned so that as the fluidics head moves down the sample delivery axis it first encounters a material exchange station that transfers pipette tips, then a material exchange station that transfers fluid, and then the analysis station.

19. The fluid delivery system of claim 17, wherein each of the material exchange and analysis stations has a carriage assembly that moves material to and from the fluidics head in a direction perpendicular to the sample delivery axis.

20. The fluid delivery system of claim 19, wherein the carriage assemblies move in parallel directions relative to each other.

21. The fluid delivery system of claim 13, wherein the dispensing device has an array of pipette channels.

22. The fluid delivery system of claim 13, wherein one of the material exchange stations may be used as an analysis station in a light detection instrument.

23. A system for delivering fluid to an examination site in a light detection instrument, comprising:

a head assembly including a fluid transfer device;

a drive mechanism connected to the head assembly for moving the head assembly along a vertical sample delivery axis;

a tip loading station positioned along the sample delivery axis where disposable tips can be temporarily attached and detached to and from the fluid transfer device;

a tip carrier assembly that is moveable in a direction perpendicular to the sample delivery axis to and from the tip loading station; and

an examination site positioned along the sample delivery axis, wherein the fluid transfer device can be moved along the sample delivery axis to pick up tips at the tip loading station and to deliver fluid to the examination site.

24. The system of claim 23, wherein the examination site is one of plural examination sites located at an analysis station, each examination site having a vertical sample delivery axis along which the fluid transfer device is capable of delivering fluid.

25. The system of claim 23, wherein the fluid transfer device has a tip removal mechanism.

26. A system for delivering fluid to an examination site in a light detection instrument, comprising:

a head assembly including a pipette device;

a drive mechanism connected to the head assembly for moving the head assembly along a vertical sample delivery axis;

a first pipetting station positioned along the sample delivery axis where the pipette device can dispense and aspirate fluid to and from a container;

a fluid carrier assembly that is moveable in a direction perpendicular to the sample delivery axis to and from the first pipetting station; and

an examination site positioned along the sample delivery axis, wherein the pipette device can be moved along the sample delivery axis to pick up fluid at the first pipetting station and to deliver fluid to the examination site.

27. The system of claim 26, wherein the examination site is one of plural examination sites located at an analysis station, each examination site having a vertical sample delivery axis along which the pipette device is capable of delivering fluid.

28. The system of claim 27, wherein the analysis station includes top and bottom optics heads, each optics head being moveable laterally for detecting light from the plural examination sites, the top optics head also being moveable out of the way of the pipette device when fluid is being delivered.

29. The system of claim 26 further comprising a pipette loading station along the sample delivery axis where pipette tips can be attached or detached to or from the pipette device.

30. The system of claim 26 further comprising a first processor coupled to the head assembly, wherein the first processor controls the preparation of each of a plurality of samples and determines at least one time tag corresponding to a sample preparation step for each of the plurality of samples.

31. A fluid delivery system, comprising:

a fluidics head assembly including a pipette device;

a drive mechanism connected to the head assembly for moving the head assembly along a vertical sample delivery axis; and

at least two material exchange stations located along the sample delivery axis, each material exchange station having a carriage, the carriages moving in parallel directions perpendicular to the sample delivery axis.

32. An instrument, comprising:

a fluidics head moveable along a vertical sample delivery axis to and from an array of examination sites; and

a top optics head assembly that is moveable laterally to positions above each examination site along respective sample delivery axes, and also moveable out of the way of the fluidics head when fluid is being delivered to one or more examination sites.

33. The instrument of claim 32 further comprising a bottom optics head that is moveable laterally to positions above each examination site along respective sample delivery axes to detect light from samples at one or more examination sites.

34. A light detection instrument and fluid delivery system, comprising:
an analysis chamber having an opening above an examination site;
a fluidics head moveable along a sample delivery axis extending vertically from the examination site through the opening in the analysis chamber; and
a carriage assembly that moves horizontally relative to the sample delivery axis to carry a fluid container to and from the fluidics head, wherein the carriage assembly may be positioned to substantially close the opening of the analysis chamber when light is being detected from a sample at the examination site.

35. A light detection instrument and fluid delivery system, comprising:
an analysis chamber having an opening above an examination site; and
a fluidics head moveable along a sample delivery axis extending vertically from the examination site through the opening in the analysis chamber, wherein the fluidics head is dimensioned in relation to the opening such that light transmission through the opening may be substantially blocked when the fluidics head is delivering fluid to the examination site.

36. A method of performing an analysis on a sample, comprising:
robotically transporting a fluidics head along a sample delivery axis to a fluid transfer station;
aspirating fluid at the fluid transfer station to the fluidics head for further transport along the sample delivery axis;
robotically transporting the fluidics head further along the sample delivery axis to an examination site;
dispensing fluid from the pipette tips to a sample container at the examination site; and
detecting light from fluid at the examination site.

37. The method of claim 36 further comprising:

robotically transporting the fluidics head along the sample delivery axis to a pipette tip loading station; and

loading one or more pipette tips onto the fluidics head before transporting the fluidics head to the fluid transfer station.

38. The method of claim 37, wherein all of the steps are performed generally along a single linear processing path.

39. The method of claim 36, wherein the step of dispensing fluid from the pipette tips further comprises recording a plurality of time tags corresponding to an addition of fluid to each of a plurality of samples.

40. The method of claim 36, wherein the step of detecting light from fluid at the examination site further comprises recording a plurality of time tags corresponding to detecting light from each of a plurality of samples.